

# Rezaul Karim, Ph.D.

Staff Data Scientist, ALDI SÜD - International Data & Analytics, Germany

in <https://linkedin.com/in/karimrwth> GitHub <https://github.com/rezacsedu> +49 157 5968 5418

@ [rezaul.karim.fit@gmail.com](mailto:rezaul.karim.fit@gmail.com) Altstraße 43, 52066 Aachen, Germany 38 years, Bangladeshi



I'm adept and experienced at analyzing large-scale datasets, developing accurate predictive models using advanced analytical methods, and implementing data-driven solutions to complex research and business problems and making them interpretable to deliver actionable insights. I'm passionate about data science, machine learning, knowledge graphs, and explainable AI (XAI).

## EXPERIENCE

- 01.01.2023  
Present

**Staff Data Scientist, ALDI SÜD - INTERNATIONAL DATA & ANALYTICS, Mülheim an der Ruhr, Germany**
  - Leading the development and optimization of stock allocation model for ALDI that already helped reduce the markdown and write-off losses by 5%.
  - Improved the interpretability of the stock allocation model that helps ALDI understand the most important factors and observe behavioural price effects
  - Successfully deployed the stock allocation model and scaled up the inference pipeline having proper monitoring (e.g., post-deployment data science).

Python Keras PySpark PyTorch Spark ML Spark SQL scikit-learn PyCaret Azure ML Databricks Databricks AutoML Azure Feature Store Azure DevOps JupyterLab Docker MLflow Git.
- 01.07.2023  
31.10.2023

**Lead AI Consultant (part-time), ADVANCED DATA ANALYTICS (ADA), Dubai, U.A.E.**
  - Led the data science development team :
    - Successfully built and optimized the financial sentiment analysis model for UAE clients.
    - Deployed the optimized model using MLflow on Azure infrastructure.

Python Spark ML/SQL Fast API Git Hugging Face BERTs LLMs
- 01.07.2017  
31.12.2022

**Data Scientist→Senior Data Scientist, FRAUNHOFER FIT, Sankt Augustin, Germany**
  - Led the Explainable AI (XAI) team within Data Science & AI department :
    - Provided interpretable ML solutions to several healthcare & pharma clients
    - Developed privacy-preserving ML methods for anti-money laundering.
    - Constructed a large-scale knowledge graph (KG), quality assessment of the KG, and built a yield prediction model for smart precision farming for an EU project.
  - Co-acquired several industry and research funding (German/EU) of AI calls.

Python Scala Java Keras Spark ML OpenCV TensorFlow scikit-learn SHAP PyCaret Zeppelin JupyterLab Docker Flask FastAPI Spark SQL Git.
- 01.10.2021  
31.03.2022

**Postdoctoral Researcher (Part-time), RWTH AACHEN UNIVERSITY, Germany**
  - Did research in explainable AI, applied ML, semantic web, and the intersection of Knowledge Graphs (KGs) with Large Language Models (LLMs) with a focus on healthcare and NLP.
  - Co-acquired several industry and research funding (German/EU) of AI calls.
  - Teaching-related activities with Prof. Dr. Stefan Decker
  - Supervising bachelor and master theses.
- 30.05.2017  
03.06.2015

**ML Engineer, INSIGHT CENTRE FOR DATA ANALYTICS, Galway, Ireland**
  - Developed NLP applications for biomedical text mining for an EU project.
  - Built large-scale biomedical KGs for exploring and predicting drug-drug interactions and cancer genomics for two Irish clients (pharma & hospital).

Spark Scala Hadoop Java scikit-learn Spark ML DeepLearning4j Jupyter Docker Spark SQL Git
- 29.05.2015  
30.08.2012

**Senior Software Engineer→Lead Software Engineer, SAMSUNG ELECTRONICS, South Korea**
  - Led Android Camera & Music team for Middle East & Africa (MEA) region.
  - Developed new features for several Android and Tizen OS projects.
  - Finished customer-specific customization for Voice Recorder, text-to-speech (TTS), & S-Voice applications for several Android projects successfully.
  - Worked as Field Test Engineer (in Turkey) and User Interface Test Engineer (in Korea) to support R & D to identify network outages for the MEA customers.

Java C C++ Perforce Android Tizen CI/CD Hudson Gradle Eclipse Maven

03.09.2009 | **Software Engineer, i2SOFT TECHNOLOGY, Dhaka, Bangladesh**  
 26.08.2010 | > Developed web applications for local clients with cross-browser functionality.  
 > Developed two ERP-based desktop software for local clients.  
 > Module-wise technical documentation for the developed services.

JavaScript JQuery HTML CSS3 PHP MySQL REST.

## EDUCATION

- 2017-2021 **Ph.D. in Computer Science**, RWTH Aachen University, Germany  
**Thesis title** : Interpreting Black-Box Machine Learning Models with Evidence-based Decision Rules and Knowledge Graph Reasoning  
**Supervisor** : Prof. Dr. Stefan Decker and Prof. Dr. Dietrich Rebholz-Schuhmann  
**Dissertation grade** : Summa Cum Laude
- 2010-2012 **M.Sc. in Computer Science**, Kyung Hee University, South Korea  
**Grade** : 4.038/4.30 ( $\approx$ Summa Cum Laude)  
**Major** : in data mining and knowledge discovery with a minor in AI and cryptography  
**Thesis title** : Privacy Preserving Mining Maximal Frequent Patterns in Transactional Databases  
**Supervisor** : Prof. Dr. Byeong-Soo Jeong
- 2004-2008 **B.Sc. in Computer Science**, University of Dhaka, Bangladesh  
**Major** : Computer Science with a minor in mathematics and statistics.  
**Grade** : First class honours.

## TOOLS & SKILLS

<b>Languages</b>	Python, Java, SQL, Scala
<b>Machine/deep learning</b>	SVM, XGBoost, Random Forest, CNN, Autoencoders, RNN, BERTs
<b>Model deployment, monitoring, MLOps</b>	Flask, Streamlit, FastAPI, MLflow
<b>Data science tools and libraries</b>	NumPy, Pandas, Spark ML/SQL, scikit-learn, Keras, PyTorch, DeepLearning4j
<b>XAI toolkits</b>	SHAP, LIME, ExplainerDashboard, ELI5
<b>AutoML</b>	Auto-sklearn, Auto-Keras, Azure AutoML, PyCaret
<b>Containerization technologies</b>	Docker
<b>Semantic Web technologies</b>	RDF, SPARQL, Apache Jena, ontology, Virtuoso, Knowledge Graphs
<b>DevOps</b>	Git, Azure DevOps
<b>Cloud platforms</b>	Azure ML, Azure Feature Store, Azure Data Factory.
<b>Big data stack</b>	PySpark, Hadoop, Databricks
<b>Databases</b>	MySQL, PostgreSQL, MongoDB

## CERTIFICATIONS

- > Databricks Certified Machine Learning Professional
- > Microsoft Certified Azure Data Scientist.

## ACADEMIC AND PROFESSIONAL ACHIEVEMENTS

- > **Fraunhofer ICT Dissertation Award 2023** endowed with a research grant of 5,000€ for my PhD thesis “Interpreting Black-Box Machine Learning Models with Decision Rules and Knowledge Graph Reasoning”, *RWTH Aachen University*, 2022.
- > **ICT Young Researcher Award 2020** for my outstanding contributions to ICT-related research at RWTH Aachen University, Germany. It is endowed with a research grant of 1,500€.
- > **Best Application Paper Award** for my paper titled “Classification Benchmarks for Under-resourced Languages” at 7<sup>th</sup> IEEE International Conference on Data Science and Advanced Analytics (DSAA’2020), Sydney, Australia, October, 2020.
- > **Employee of the Month at Samsung Electronics** for December 2014 for outstanding contributions to Android commercialization projects in the Middle East and Africa region.

## SELECTED PUBLICATIONS

1. **Md. Rezaul Karim**, Oya Beyan, Achille Zappa, Ivan G. Costa, Dietrich Rebholz-Schuhmann, Michael Cochez, and Stefan Decker, “From Large Language Models to Knowledge Graphs for Biomarker Discovery in Cancer”, *Hawaii International Conference on System Sciences (HICSS)*, Hawaii, USA, January 3-6, 2024.

🔗 <https://arxiv.org/pdf/2310.08365v2.pdf>  
🔗 [https://github.com/rezacsedu/llms\\_to\\_kgs\\_for\\_cancer](https://github.com/rezacsedu/llms_to_kgs_for_cancer)

2. **Md. Rezaul Karim**, Oya Beyan, Achille Zappa, Ivan G. Costa, Dietrich Rebholz-Schuhmann, Michael Cochez, and Stefan Decker, "Deep Learning-based Clustering Approaches for Bioinformatics", *Briefings in Bioinformatics*, February 2020.  
🔗 <https://academic.oup.com/bib/advance-article/doi/10.1093/bib/bbz170/5721075>  
🔗 <https://github.com/rezacsedu/Deep-learning-for-clustering-in-bioinformatics>
3. **Md. Rezaul Karim**, Md. Shajalal, Alex Graß, Christian Beecks, and Stefan Decker, "Interpreting Black-box Machine Learning Models for High Dimensional Datasets", *Proc. of IEEE International Conference on Data Science and Advanced Analytics (DSAA'2023)*, Thessaloniki, Greece, October 9-13, 2022.  
🔗 <https://github.com/AwesomeDeepAI/DeepExplainHidim>
4. **Md. Rezaul Karim**, Felix Hermesen, Sisay Adugna Chala, and Avikarsha Mandal, "Catch Me If You Can : Semi-supervised Graph Learning for Spotting Money Laundering", *arXiv preprint arXiv:2302.11880*, November 2022.  
🔗 <https://github.com/AwesomeDeepAI/DeepExplainHidim>
5. **Md. Rezaul Karim**, Oya Beyan, Dietrich Rebholz-Schuhmann, Michael Cochez, and Stefan Decker, "Explainable AI for Bioinformatics : Methods, Tools, and Applications", *Briefings in Bioinformatics*, June, 2023.  
🔗 <https://github.com/rezacsedu/Deep-learning-for-clustering-in-bioinformatics>
6. **Md. Rezaul Karim**, Michael Cochez, Oya Beyan, Stefan Decker, and Christoph Lange-Bever, "OncoNetExplainer : Explainable Predictions of Cancer Types Based on Gene Expression Data", *Proc. of IEEE International Conference on Bioinformatics and Bioengineering (BIBE'2019)*, Athens, Greece, October 28-30, 2019.  
🔗 <https://ieeexplore.ieee.org/document/8941872>  
🔗 <https://github.com/rezacsedu/Explainable-cancer-type-prediction>
7. **Md. Rezaul Karim**, Michael Cochez, Mamta Uddin, Oya Beyan, and Stefan Decker, "Drug-Drug Interaction Prediction Based on Knowledge Graph Embeddings and Convolutional-LSTM Network", *Proc. of ACM International Conference on Bioinformatics, Computational Biology, and Health-informatics (ACM-BCB'2019)*, Niagara Falls, New York, USA, September 7-10, 2019.  
🔗 <https://dl.acm.org/doi/10.1145/3307339.3342161>  
🔗 <https://github.com/rezacsedu/Drug-drug-interaction-prediction>
8. **Md. Rezaul Karim**, Tanhim Islam, Dietrich-Rebholz Schuhmann, and Stefan Decker, "Adversary-aware Multimodal Neural Networks for Cancer Diagnosis based on Multi-omics Data", *IEEE Access*, Page(s) : 54386 - 54409, 17 May 2022.  
🔗 [https://github.com/rezacsedu/Adversary\\_Aware\\_Multimodal\\_Neural\\_Networks](https://github.com/rezacsedu/Adversary_Aware_Multimodal_Neural_Networks)
9. **Md. Rezaul Karim**, Michael Cochez, Oya Beyan, and Stefan Decker, "Mining Maximal Frequent Patterns in Big Transactional Databases and Dynamic Data Streams : A Spark Based Approach", *Information Sciences*, Vol-432, pp 278-300, March 2018.  
🔗 <https://www.sciencedirect.com/science/article/pii/S002002551731126X>  
🔗 <https://github.com/rezacsedu/Mining-Maximal-Frequent-Pattern-Spark>
10. **Md. Rezaul Karim**, Ashiqur Rahman, João Bosco Jares, Stefan Decker, and Oya Beyan, "A Neural Ensemble Method for Cancer Type Prediction Based on Copy Number Variations", *Neural Computing and Applications*, November 30, 2019.  
🔗 <https://link.springer.com/article/10.1007/s00521-019-04616-9>  
🔗 <https://github.com/rezacsedu/Neural-ensemble-method-for-cancer-prediction>
11. **Md. Rezaul Karim**, Galih Wicaksono, Ivan G. Costa, Stefan Decker, and Oya Beyan, "Multimodal Autoencoders for Prognostically Relevant Subtypes and Survival Prediction for Breast Cancer", *IEEE Access*, September 2019.  
🔗 <https://ieeexplore.ieee.org/document/8839793>  
🔗 <https://github.com/rezacsedu/Multimodal-autoencoder-for-breast-cancer>
12. Lars C. Gleim, **Md. Rezaul Karim**, Lukas Zimmermann, Oliver Kohlbacher, Holger Stenzhorn, Stefan Decker, and Oya Beyan, "Enabling Ad-hoc Reuse of Private Data Repositories through Schema Extraction", *Journal of Biomedical Semantics*, volume 11, Article number : 6 (2020), July 8 2020.  
🔗 <https://jbiomedsem.biomedcentral.com/articles/10.1186/s13326-020-00223-z>  
🔗 <https://github.com/PersonalHealthTrainGermany/schemaExtraction>

13. **Md. Rezaul Karim**, Audrey Michel, Achille Zappa, Pavel Baranov, Ratnesh Sahay, and Dietrich Rebholz-Schuhmann, "Improving Data Workflow Systems with Cloud Services and Use of Open Data for Bioinformatics Research", *Briefings in Bioinformatics*, Vol-19, Issue 5, September 2018, Pages 1035–1050, DOI : 10.1093/bib/bbx039.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6169675/pdf/bbx039.pdf>
14. Alok Kumar Jha, Yasar Khan, Muntazir Mehdi, **Md Rezaul Karim**, Qaiser Mehmood, Achille Zappa, Dietrich Rebholz-Schuhmann, and Ratnesh Sahay, "Discovering Biomarker and Pathway for Gynecological Cancers", *Journal of Biomedical Semantics*, 8(1), September 2017, DOI : 10.1186/s13326-017-0146-9.  
<https://jbiomedsem.biomedcentral.com/articles/10.1186/s13326-017-0146-9>
15. **Md. Rezaul Karim**, Michael Cochez, Oya Beyan, Dietrich-Rebholz Schuhmann, and Stefan Decker, "Convolutional Embedded Networks for Population Scale Clustering and Bio-ancestry Inferencing", *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, Volume-19, Page(s) : 369-382, February, 2022.  
<https://ieeexplore.ieee.org/document/9095229>  
<https://github.com/rezacsedu/Convolutional-embedded-networks>
16. **Md. Rezaul Karim**, Jiao Jiao, Till Döhmen, Michael Cochez, Oya Beyan, Dietrich-Rebholz Schuhmann, and Stefan Decker, "DeepKneeExplainer : Explainable Knee Osteoarthritis Diagnosis from Radiographs and Magnetic Resonance Imaging", *IEEE Access*, Volume-9, Page(s) : 39757 - 39780, 26 February 2021.  
<https://ieeexplore.ieee.org/document/9363889>  
[https://github.com/rezacsedu/DeepKneeOAEExplainer\\_](https://github.com/rezacsedu/DeepKneeOAEExplainer_)
17. **Md. Rezaul Karim**, Till Döhmen, Michael Cochez, Oya Beyan, Dietrich Rebholz-Schuhmann, and Stefan Decker, "DeepCOVIDExplainer : Explainable COVID-19 Diagnosis from Chest X-ray Images", *Proc. of IEEE International Conference on Bioinformatics and Biomedicine (BIBM'2020)*, Seoul, South Korea, December 16-19, 2020.  
<https://arxiv.org/abs/2004.04582>  
<https://github.com/rezacsedu/DeepCOVIDExplainer>
18. **Md. Rezaul Karim**, Bharathi Raja Chakravarti, Mihael Arcan, John P. McCrae, and Michael Cochez, "Classification Benchmarks for Under-resourced Bengali Language based on Multichannel Convolutional-LSTM Network", *Proc. of IEEE International Conference on Data Science and Advanced Analytics (DSAA'2020)*, Sydney, Australia, October 2020.  
<https://arxiv.org/abs/2004.07807>  
[https://github.com/rezacsedu/Classification\\_Benchmarks\\_Benglai\\_NLP](https://github.com/rezacsedu/Classification_Benchmarks_Benglai_NLP)
19. **Md. Rezaul Karim**, Sumon Kanti Dey, Tanhim Islam†, Sagor Sarker, Mehadi Hasan Menon, Kabir Hossain, Md. Azam Hossain, and Stefan Decker, "DeepHateExplainer : Explainable Hate Speech Detection in Under-resourced Bengali Language", *Proc. of IEEE International Conference on Data Science and Advanced Analytics (DSAA'2021)*, Portugal, October 6-9 2021.  
<https://arxiv.org/pdf/2012.14353.pdf>  
<https://github.com/rezacsedu/DeepHateExplainer>
20. **Md. Rezaul Karim**, Sumon Kanti Dey, Tanhim Islam†, and Bharathi Raja Chakravarti, "Multimodal Hate Speech Detection from Bengali Memes and Texts", *Proc. of International conference on Speech & Language Technology for Low-resource Languages (SPELLL'2022)*, Tamil Nadu, November 23-25, 2022.  
<https://arxiv.org/abs/2204.10196>  
<https://github.com/rezacsedu/Multimodal-Hate-Speech-Bengali>
21. **Md. Rezaul Karim**, Hussain Ali, Prinon Das, Mohamed Abdelwaheb, and Stefan Decker, "Question Answering Over Biological Knowledge Graph via Amazon Alexa", November 2022.  
<https://arxiv.org/abs/2210.06040>  
<https://github.com/rezacsedu/Multimodal-Hate-Speech-Bengali>

Together with Prof. Dr. Stefan Decker, I supervised following bachelor and master theses at RWTH Aachen University, Germany :

1. FAIR Approach for Improving Discoverability and Reusability of Research Data (Bachelor thesis, 2017)
2. Using Deep Neural Networks and Copy Number Variations for Cancer Detection (Master thesis, 2018)
3. Analysis of Breast Cancer Genomics Data with Multimodal Deep Belief Network (Master thesis, 2018).
4. Classification of Cancer with Methylation-aware Motifs (Bachelor thesis, 2019)
5. A Fully Automated Localization and Semantic Segmentation Technique for Biomedical Imaging (Master thesis, 2019)
6. Deep Learning-based Knee Osteoarthritis Diagnosis from Radiographs and MRI Images (Master thesis, 2019)
7. Revealing Black-box Biomedical Patent Classification Models with Explanation Methods (Bachelor thesis, 2020)
8. Imputation in Graphs Using Machine Learning (Master thesis, 2020)
9. Improving Human-AI Interaction via Explainable Chatbot : A Case Study for COVID-19 Diagnosis (Master thesis, 2021)
10. A Meta learning-based Approach for Automating Image Analysis in Cell Biology (Master thesis, 2022).

## MERITS IN TEACHING AND PEDAGOGICAL COMPETENCE

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I have contributed in preparation of lectures, exercise sessions, providing lectures, exam grading, conducting lab sessions, and supervising seminar topics for several courses offered by Prof. Dr. Stefan Decker at RWTH Aachen University, Germany (and others) :

1. Lecturer for Master in Medical Data Science Program, RWTH Aachen Academy, 2021/2022
2. Semantic Web (Winter semester, 2021/2022)
3. Knowledge Graphs Praktikum (Winter semester, 21/22 & 22/23)
4. Methods for Data Reusability (Winter semester, 2020/2021)
5. Knowledge Graphs Praktikum (Winter semester, 2020/2021)
6. Methods for Data Reusability (Winter semester, 2019/2020)
7. Knowledge Graphs Praktikum (Spring semester, 2019)
8. Knowledge Graphs Praktikum (Spring semester, 2018)
9. Object-Oriented Programming with Java (Winter, 2015/2016), University of Galway, Ireland.

## ACQUIRING RESEARCH GRANTS

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1. Research grant of 5,000€ for Fraunhofer ICT Dissertation Award 2023.
2. Co-acquire research grant of NFDI4DataScience worth 5M€.
3. Co-acquirer of BMBF grant worth 5M€ for the German-French joint project Crypto4GraphAI project
4. Research grant for best paper award of worth 500€ for best paper award at IEEE International Conference on Data Science and Advanced Analytics (DSAA), Sydney, Australia, October 2020.
5. Research grant worth 1,500€ for ICT Young Researcher award at RWTH Aachen University, November 2020
6. Kyung Hee University President Scholarship of worth 6,000€ spanning over 2 years (2010 - 2012).
7. Digital Ocean Cloud Computing Research grant worth 960€ for hosting computing infrastructure for bachelor and master thesis at RWTH Aachen University.

## EDUCATION AND TRAINING

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1. Research Data Management, RWTH Aachen University, December 2022
2. Data Protection and Privacy (GDPR, BDSG), Fraunhofer Internal, September 2018.
3. Corruption Prevention, Fraunhofer Internal, September 2018.
4. Scientific Integrity, RWTH Aachen University, September 2021.
5. International Summer School on Deep Learning, Warsaw, Poland, July, 2019.

The candidate participated in several conferences as part of the journey of this thesis :

1. Presented paper titled “From Large Language Models to Knowledge Graphs for Biomarker Discovery in Cancer” at 57th *Hawaii International Conference on System Sciences (HICSS)*, Hawaii, USA, January 3-6, 2024.
2. Presented paper titled “Interpreting Black-box Machine Learning Models for High Dimensional Datasets”, at 10th *IEEE International Conference on Data Science and Advanced Analytics (DSAA'2023)*, Thessaloniki, Greece, October 9-13, 2022.
3. Research talk on Explainable AI at the University of Siegen, Germany, November 2021.
4. Presented paper titled “Drug-Drug Interaction Prediction Based on Knowledge Graph Embeddings and Convolutional-LSTM Network” at 10th *ACM International Conference on Bioinformatics and Computational Biology (ACM-BCB)*, Niagara Falls, New York, USA, September 7-10, 2019.
5. Presented paper titled “Cancer Risk and Type Prediction Based on CNVs with LSTM and Deep Belief Network” at 1<sup>st</sup> *Artificial Intelligence International Conference (A2IC'2018)*, November 21-23, Barcelona, Spain.
6. Presented paper titled “OncoNetExplainer : Explainable Predictions of Cancer Types Based on Gene Expression Data” at 19<sup>th</sup> *IEEE International Conference on Bioinformatics and Bioengineering (BIBE 2019)*, October 27-30, 2019.
7. Presented paper titled “DeepCOVIDExplainer : Explainable COVID-19 Diagnosis from Chest X-ray Images”. at 14<sup>th</sup> *International Conference on Bioinformatics and Biomedicine (BIBM'2020)*, Seoul, South Korea, December 16-19, 2020.
8. Presented paper titled “Classification Benchmarks for Under-resourced Bengali Language with Multichannel Convolutional-LSTM Network” at *IEEE International Conference on Data Science and Advanced Analytics (DSAA)*, Sydney, October 2020.
9. Organized and gave talk for hackathon “Deep Neural Networks for Analysing Cancer Genomics Data” at *International Semantic Web Applications & Tools for Healthcare and Life Sciences (SWAT4HCLS)* Conference, Rome, Italy, 4-7 December 2017.
10. Presented paper titled “DeepHateExplainer : Explainable Hate Speech Detection in Under-resourced Bengali Language” at 8<sup>th</sup> *IEEE International Conference on Data Science and Advanced Analytics (DSAA'2021)*, Porto, Portugal, October 6-9, 2021.

## REVIEW WORKS (PC MEMBERS + REVIEWERS)

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- European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD)
- IEEE International Conference on Data Science and Advanced Analytics (DSAA)
- The International AAAI Conference on Web and Social Media (ICWSM)
- The Hawaii International Conference on System Sciences (HICSS)
- The ACM International Conference on Web Science (WebSci)
- The International Semantic Web Conference (ISWC)
- The Extended Semantic Web Conference (ESWC)
- The Web Conference (WWW)
- IEEE/ACM Transactions on Computational Biology and Bioinformatics
- IEEE Transactions on Neural Networks and Learning Systems
- Journal of Expert Systems with Applications
- Journal of Briefings in Bioinformatics
- Journal of Biomedical Semantics
- Journal of IEEE Access
- Semantic Web Journal.

## CONTRIBUTIONS TO OPEN-SOURCE AND REPRODUCIBLE SCIENCE

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I made source-codes of my several publications open access for the research communities. Besides, I contributed to several open-source implementations, which include feature implementations, filing issues, pull requests, and answering technical questions :

- GitHub and GitLab
- Apache Spark
- LIME, ExplainX, ExplainerDashboard, SHAP
- PyCaret
- StackOverflow.

There are 381 repositories in my GitHub account<sup>1</sup>, spanning over 519 starts. Besides, I made several research datasets openly accessible that came with GitHub, Figshare<sup>2</sup>, and via Fraunhofer owncloud.

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1. <https://github.com/rezacsedu>  
2. <https://figshare.com/>